Thermostat with Remote p-n Diode Sensor

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It is well known that the p-n junction of a diode has a temperature coefficient of –2 mV/°C, and this fact is often used for temperature measurement. With the new MAX651x IC family from Maxim, there is now a range of integrated thermostats with external pn-junction sensors. These devices are particularly suitable for monitoring the temperature of a chip if a diode or transistor is available within the chip for use as a sensor. A two-wire connection to the remote sensor element is necessary, even if one side (DXN) lies at ground potential. Otherwise the measurement result could be corrupted by ground currents.

The MAX651x ICs contain a converter stage that generates the temperature voltage from the forward voltage of the external pn junction. The temperature voltage is compared to a reference potential, and the comparator output switches the output as appropriate. The switching hysteresis can be selected via the HYST pin, in order to avoid output oscillations. When HYST is grounded, the hysteresis is

5 °C. If HYST is connected to V_{DD}, the hysteresis is 10 °C.
The three members of the MAX651x family have different output configurations, as follows:

MAX 6511: active-low CMOS output.
MAX 6512: open drain output (switched to ground in case of overtemperature).
MAX 6513: active-high CMOS output.

Each IC has a fixed switching temperature that is pre-programmed into the IC by the manufacturer. Values ranging from +45 °C to +125 °C in steps of 10 °C are available, or in other words, +45 °C, +55 °C and so on, up to +125 °C. At a supply voltage of 3.0 V to 5.5 V, the IC draws only 400 μA. It is housed in an SOT23 SMD transistor package.

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